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1. Your reference **JCD-G32688**

13JUN02 E725449-1 D00346
P01/7700 0.00-0213563.0

2. Patent application number *(The Patent Office will fill in this part)* 13 JUN 2002 0213563.0

3. Full name, address and postcode of the or of each applicant *(underline all surnames)*

Kiren Nangla
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Patents ADP number *(if you know it)* 08074817001

If the applicant is a corporate body, give the country/state of its incorporation

4. Title of the invention **Method of Making a Textile Material and Textile Material Made Thereby**

5. Name of your agent *(if you have one)* **Bailey Walsh & Co.**

"Address for service" in the United Kingdom to which all correspondence should be sent *(including the postcode)*

5, York Place
Leeds
LS1 2SD

Patents ADP number *(if you know it)* **224001**

6. If you are declaring priority from one or more earlier patent applications, give the and the date of filing of the or of each of these earlier applications and *(if you know it)* the or each application number

Country	Priority application number *(if you know it)*	Date of filing *(day / month / years)*

7. If this application is divided or otherwise derived from an earlier UK application, the earlier application

Number of earlier application	Date of filing *(day / month / years)*

3. Is a statement of inventorship and of right to grant of a patent required in support of this request? *(Answer "Yes" if:*

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a) any applicant named in part 3 is not an inventor, or

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METHOD OF MAKING A TEXTILE MATERIAL, AND TEXTILE MATERIAL MADE THEREBY

FIELD OF THE INVENTION

This invention relates to a method of making a textile material, and to a textile material made thereby.

BACKGOUND TO THE INVENTION

Many types of textile materials are known. It is possible to weave threads to form a textile material; it is also possible to knit threads to form a textile material. Two basic types of knitted fabrics are known, weft-knitted fabrics in which the threads follow a path generally transversely or across the width of the fabric, and warp-knitted fabrics in which a number of warp threads follow a path which is generally longitudinal or along the length of the fabric.

Certain materials are made up of threads which exhibit different colours when viewed from differing angles, so that a textile can appear blue when viewed from one angle, and green when viewed from another, for example. In addition, metallic lame' textiles are known, in which a metallic foil is coated or printed onto the surface of a basic fabric.

STATEMENT OF THE INVENTION

It is an object of the present invention to provide a textile material in which the appearance of the material can be altered by means of stretching the fabric. In certain embodiments the appearance is reversible, so that returning the textile to its original form returns it substantially to its original appearance.

According to the invention, there is provided a method of making a textile material, comprising the following steps:-
(i) selecting a warp-knitted, weft-knitted or woven base fabric, (ii) applying a coating to at least part of one side of the fabric, the coating being of a different colour to the base fabric (the same colour could be used, but a different colour would result in a more striking effect); (iii) stretching the coated fabric in a substantially transverse direction of the fabric; and (iv) stretching the coated fabric in a substantially longitudinal direction of the fabric.

Preferably, the base fabric is a standard warp-knitted fabric with a 28 gauge. Preferably also, the base fabric is made from texturised polyester.

Desirably, the coating is of a foil, preferably metallic foil. Desirably also, the coating is secured to the fabric, or rather to parts of the threads thereof, by way of an adhesive which has previously been applied thereto. A suitable procedure for applying the coating is the " Metatran" ™ system used in the production of metallic foiled materials. Desirably also, a "Transfer Coating" or "Laminating" procedure for applying the foil coating could be used for the production of metallic lame' textiles materials.

Desirably, the method comprises the steps of successive stretching steps in the substantially transverse and longitudinal directions, until the desired degree of stretching has been applied to the coated fabric. Desirably also, sections of the fabric can be stretched in both directions before other sections of the fabric have been stretched. Alternatively, substantially all of the fabric which is desired to be stretched can be stretched in sections in one direction, Before being stretched in sections (perhaps different sections) in the other direction.

There is also provided a textile material made by the method as herein defined.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention will now be described, by way of example, with reference to the accompanying drawings, in which:-

Fig.1 .... is a schematic view of the textile material part-way through the method, part of the fabric having been stretched where the warp of the fibres are resulting it to 'give' in one direction;

Fig.2 is a schematic view of the textile material after part of the fabric has been stretched in the second direction against the salvage; and

Fig.3 is a schematic view of the finished textile material made according to the Method, with patterns applied thereto.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

The method employs the steps of choosing a warp-knitted, weft-knitted or woven base fabric. A suitable fabric is a warp-knitted fabric made of texturised polyester (or other 100% synthetic material) and is of 28 gauge.

The coating is applied to the fabric using the "Metatran" ™ foil transfer system (or other textile transfer coating, laminating procedure). This system utilises a screen printable adhesive and a heat transfer foil, and is used for the production of mirror-finished metallic prints commonly referred to as metallic lame' fabrics (finished coating does not have to be metallic, it could also be matt for a different look). There are two procedures of making a textile material using the Metatran system.

The first procedure is to print the adhesive directly onto the fabric. The adhesive is then set, for example in a convection oven or a long/medium wave infra-red stove, at a temperature of 110-130oC for 1-2 minutes. The fabric is then placed on a heat transfer press and a piece of foil is located over the area of the fabric to which the adhesive has been applied. It will be understood that the metallised underside of the foil should engage the adhesive during the transfer process. The foil is then transferred to the fabric by the application of heat 180oC for 15-20 seconds. The foil backing sheet is subsequently allowed to cool and is then removed.

The second procedure is to print the adhesive onto a release paper by a screen printing process. For example, a No. 43-62 monofilament screen can be used to print the adhesive onto a release paper such as TR-W28 double-sided silicone treated vegetable parchment. The adhesive is then set, for example in a convention oven or a long/medium wave infra-red stove at 100-120oC for 1-2 minutes. The adhesive is then transferred onto the fabric by the application of heat, at 180oC for 10-15 seconds. The release paper is allowed to cool and is then removed. The foil is then applied to the adhesive as in the first procedure described above.

Other textile methods of coating a base fabric with metallic or a matt layer (which could be sheets of metallic foil or pigments), such as; a "transfer coating" or a "laminating" procedure by flat-bed printing or roll printing could be desirably used too.

After the foil has been applied to the fabric, the method according to the invention requires the fabric to be "distressed" by stretching it both transversely and longitudinally, as to break down some of the structure of the fabric and induce "ladders" to be created in the fabric.

Fig.1 shows a schematic view of the fabric 10, a section 12 of which has undergone stretching in the lateral direction A, which is substantially perpendicular to the longitudinal direction B. For simplicity, the "ladders" which have been created in part 12 are shown, whereas the intact structure of the remainder of the fabric 10 is not shown in detail.

Sufficient stretching force must be applied to the fabric to cause the ladders to form, But excessive force which tears the fabric should be avoided. The creation of ladders is accompanied by the breaking down of the foil 18, i.e. the foil breaks into many separate pieces upon the surface of the fabric. Some trial and error may be involved in applying the correct amount of stretching force to a particular piece of fabric, but the inventor believes that this can quickly be learned with experience.

The fabric can be stretched manually, a section at a time (where a section can be as small a part of the overall fabric as is desired). Alternatively, the fabric can be stretched by machine, the machine having jaws which can grip the longitudinal edges 14 and the transverse edges 16 of the fabric, and apply a tension force thereto. The edges 14 and 16 can be gripped by the jaws at the same time, or sequentially; if gripped at the same time, the sequencing of the stretching should nevertheless be followed.

Notwithstanding that machine stretching could be used, it is envisaged that manual stretching of small sections will provide the best results, since as the fabric begins to stretch in one region it is easier manually to apply force to another region to ensure that the latter region also becomes stretched; with machine stretching it might be difficult to ensure that all of the fabric becomes substantially equally stretched, rather than just a small region becoming "over stretched" or torn.

As indicated above, the foil 18 which has been adhered to the fabric will be broken up by the distressing, i.e. the foil is bonded to parts of the individual threads of the fabric by a greater force then that holding the foil together.

When the section 12 of the fabric has been distressed, it is stretched in the longitudinal direction B. Once again, in Fig.2 only a section 20 is shown to be stretched in this way, though all of the fabric can be stretched together if desired.

The subsequent stretching in the longitudinal direction B further breaks down the structure of the fabric. It is important to note that the tension applied is not sufficient to break the threads within the fabric 10 (or at any rate only break a few of the threads), but is sufficient to cause the fabric structure to be altered, and significantly to be "loosened" so that the threads become more mobile within the body of the fabric.

When the entire piece of fabric 10 has been distressed by being stretched laterally and longitudinally, a finished textile material 22 (Fig.3) will have been created.

As shown in Fig.3, it can be arranged that with experience the correct degree of distressing can be applied, and perhaps repeated distressing laterally, longitudinally, laterally, longitudinally etc., so that when the textile material is pulled longitudinally the movement of the threads within the fabric is such as to take all of the foil away from

the surface of the material. In such circumstances, the foil disappears from view, and only the base material can be seen. However, when a section of the material is pulled transversely, the movement of the threads is such as to bring the foil to the surface where it is visible.

By pulling the fabric laterally and longitudinally, not only is the surface pattern and texture changing colour, the fabric length and width is also becoming larger and smaller. Thus, the structure as well as the surface texture is changing according to the direction it is being stretched. For example; when the textile material is pulled longitudinally the movement of the threads within the fabric is such as to take all of the foil away from the surface of the material, thus causing the structure of the material to contract and shrink; the appearance is matt, soft and fairly thick to the handle. However, when a section of the material is pulled transversally, the movement of the threads is such as to bring the foil to the surface where it is visible, thus the structure of the fabric loosens and widens; The appearance now becomes metallic, light and thin to the handle.

Before the "distressing method" is applied to the foil coated material, the fabric is stiff to the handle. After the successive "distressing" method is applied, altering the embodiment of the fabric structure, the material therefore becomes stretchy and elastic to the handle.

Since the movement of the threads takes place over a relatively large area of the textile material 22, A large area can be made to change appearance from the colour of the base material to the colour of the foil, and vice versa. If the base material is black and the foil is silver, for example, startling visual patterns 24 (of silver on a black background) can be created.

Thus, in Fig.3, the sections 24 have been pulled laterally, and so are of silver colour, whilst the remainder of the textile material is of black colour.

The patterns 24 which are created can be removed simply by pulling the fabric in the longitudinal direction B; alternatively, the patterns 24 can be altered by pulling adjacent sections of fabric transversely (increasing the amount of silver which is visible), or longitudinally (reducing the amount of silver which is visible). Natural and artificial light also reflect off the fabric surface when the metallic foil is visible, in turn giving the fabric a different appearance and extra depth in the colour change.

The base fabric 10 can be one of many different colours, as can the foil 16 applied thereto. However, the visual effect is greatest when there is a stark contrast between the colour of the base and the foil; a black base fabric and silver metallic foil create a very good effect.

The patterns created in the textile can be "fixed" in place by bonding the fabric to a suitable base, such as "Bondaweb"™, for example. Alternatively, the end user could have textile in the form of a garment which could be stretched to create and change patterns and structure thereon.

The visual effects which can be created are to some extent dependent upon the thickness of the base material and of the foil layer applied thereto. It has been found that a base material of 19 microns and a foil layer of 19 microns can provide reversible colour-change effects, i.e. stretching in one direction removes all of the foil from the surface so that the colour appears that of the base fabric, whilst stretching in the lateral direction brings much or all of the foil back to the surface so that the colour appears that of the foil, with subsequent stretching in the two directions repeating these colour changes. However, a base material of 12 microns with a layer of 20 microns provides a non-reversible colour change, i.e. once the fabric has been stretched to create the pattern of fabric/foil colours stretching in the lateral directions will have little effect upon the pattern, thereto creating new non-reversible texture on the surface. Some experimentation might be necessary with varying thickness of the material and the foil layer to achieve the desired effects in a given application, noting that the thinner the base material and the foil layer the more spectacular are the colour change effects which can be created.

To incorporate other synthetic and natural fibres into the texturised polyester base fabric before applying the foil layer will result in a different handle of the end material. For example, to incorporate Lycra™ into the warp of the base fabric will result the finished material to return to its original form by it-self when being stretched laterally or longitudinally; (for figure-hugging garments, the structure will maintain its shape). Tactel and Nylon could also be knitted into the base fabric to create different finishes and handle of the finished material.

Images and patterns could be printed on the surface or be knitted into the base material producing a variety of effects. For example; images of flowers, faces, and other colour compositions of designs on the material will appears and disappears as the fabric is stretched in different directions. Experimentation with different colours and patterns will result in special effects of "moving images" on a material.

Visual designs, such as; (flowers) could be printed at different stages whereof the textile material is being made. Printing method used are screen-printing or computer-aided.

The different stages at which "printing images" could be applied are:-

(i); to print a design on top of the foil layer, this could be applied before it is transferred onto the base fabric or after it has been coated onto the base fabric, thereof followed by the "distressing" method. Result will be colour-change material incorporated with images appearing and disappearing as material is stretched laterally or longitudinally.
(ii); Metallic foil is printed on top of the base material as a "designed image" before the "distressed" method is adopted.
(iii); Colour-change material is made (base fabric – foil print – distress). Thereafter, images are printed whilst the material is stretched on a flat-bed. Result will be changeable material with areas of solid patterns (unchangeable).

Images and visual patterns could also be knitted or woven into the base material in a variety of colours, this will create a different colour change appearance after the foil and distressing procedures have been carried out.

To employ different printing methods of images/patterns and embroidery will result in different appearances of the colour-change material. This applies to the base of the material as well as the foil surface.

The finished material desirably will be used for Garments, (clothes, hoisery, sportswear, swimwear). Accessories, (hats, shoes, bags, scarves/wraps). Furnishing and Interiors, (blinds, upholstery). In turn, the uniqueness of the finished products made by the textile material will change structure and size (width and length). The visual appearance of the shapes/patterns and colour also changing. For example; a short dress made by the textile material could be pulled longitudinally to become a long dress. Short sleeves could be pulled longitudinally to become long sleeves, to pull the sleeves laterally they become short again. If the garment is too tight and figure hugging it could be pulled laterally to become looser and wider. One is able to pull the fabric longitudinally and laterally in order to create the desired structure and look of the outfit to suit the wearer. Desirably, the colour and shapes on the surface of the material are also spontaneously changing. The individual is able to change the style and design of one outfit into a completely new outfit each time one wears it.

CLAIMS

1. A textile material onto which shapes and images are created, which appear and disappear as the fabric is stretched transversely and longitudinally, moving "pictures" are created as the fabric is stretched into different directions, resulting in colour change and change in texture, in turn providing almost limitless new designs from the same material.

2. A textile material claimed in claim 1, can be altered by means of stretching the material resulting in the colour changes of the fibres as well as altering the structure of its makeup.

3. The variety of shapes and patterns created on the surface of the material as claimed in claims 1 & 2 will change from being matt to metallic, and from metallic to matt as the material is stretched vertically, horizontally and at different angles, the shapes and patterns are spontaneous and will be different each time the material is stretched and pulled in the different directions.

4. As claimed in claims 2 & 3 successive stretching of the material in substantially transverse and longitudinal directions exhibits different colours when viewed from differing angles, the colour changes do not have to be metallic but could be matt/opaque shades of colour.

5. Stretching the material both transversely and longitudinally as claimed in claim 3 & 4 is sufficient to cause the fabric structure to be altered in that when it is pulled longitudinally the movement of the threads within the fabric is such as to take all of colour/foil away from the surface what will appear is the matt base material, when the material is pulled transversely the movement of the threads is such as to bring the colour/foil to the surface which is transformed to metallic or colourful and the matt base material disappears from view.

6. The material as claimed in claim 3 could be altered to change from matt to metallic and vice-versa, in turn printed images of flowers or faces or other visual designs will appear and disappear from view as the material is stretched in a transverse and longitudinal direction.

7. As claimed in the above claims to pull the material in different directions alters the embodiment of the fabric structure causing contrasting colour changes between the base and the surface of the material which in turn creates startling visual patterns.

8. To create startling visual effects as claimed in claim 7 is best achieved if there is contrasting colour use between the base and the applied surface, for example; the base is black and the applied surface is silver, silver on the black background can be increased so that it is visible when pulling the fabric transversely or reduce the amount of silver visible by pulling the fabric longitudinally, in this manner you control the appearance and disappearance of the silver colour.

9. The base material can be one of many different colours as can the foil/colour applied thereto, the visual effect being greatest when there is a stark contrast between the colour of the base and the colour/foil as claimed in claim 8.

10. Since the movement of the threads takes place over a relatively large area if not all of the textile material a large area can be made to change appearance from the colour of the base material to the colour of the applied surface or only small sections within the material could be made to change colour and vice-versa.

11. To pull the material transversely and longitudinally not only is the surface pattern changing appearance, but so is the texture and the fabric length and width are increasing and decreasing.

12. Stretching the material both transversely and longitudinally is sufficient to alter the fabric structure and texture as claimed in claims 5 & 11
{i} when the material is pulled longitudinally the movement of the threads within the fabric is such as to take all of the foil away from the surface of the material, thus causing the structure of the material to contract and shrink – the appearance is matt, soft and thick to the handle with no creases.
{ii} when the material is pulled transversally the movement of the threads is such as to bring the foil to the surface where it is visible and the structure of the material loosens and widens – the appearance is metallic, light, see-through and thin.

13. Natural and superficial light will reflect off the fabric surface when the metallic foil is visible giving the material light reflecting properties that gives extra depth to the colour-change.

14. The visual effects which can be created are to some extent dependent upon the thickness of the base material and the foil applied thereto, noting that the thinner the base material and the foil layer the more the spectacular are the colour change effects which can be created, non-reversible colour change and texture are created when the base material is thicker as is the surface pigment applied thereto.

15. Images and patterns could be printed on the surface of the fabric or be knitted into the base of the material as claimed in claim 6, the colour compositions of the designs will appear and disappear as the fabric is stretched transversally or longitudinally resulting in special effects of "moving pictures" on a material.

16. The finished material is used for products in fashion – such as garments, sportswear, under garments, swimwear;
accessories – hats, shoes, bags, scarves/wraps;
furnishing and interiors – blinds, upholstery.

17. The uniqueness of the finished products made by the claimed textile material will alter in size in that it could increase or decrease in width and length;
it could change into different contrasting colours over a relatively large area of the material or only in small section within the fabric;
it is claimed to change from matt to metallic and metallic to matt;
moving images of visual contents (such as flowers, faces or text) can be made to appears and disappear;
the texture of the surface and handle could be altered from being thick to thin and see-through.

18. The properties of the textile material as described in claim 17 is best demonstrated when it is used to make a fashion garment such as a short dress, the short dress could be pulled longitudinally to be transformed into a long dress, short sleeves could be pulled longitudinally to become long tight sleeves to pull the sleeves in a lateral manner they will become short again and wider.

19. If the outfit is too tight and figure hugging it could be pulled laterally to become wider, the individual is able to pull the outfit longitudinally or laterally in order to create the desired look of the outfit to suit the wearer, the colour and shapes within the fabric are simultaneously also changing – one is able to change the style and design of an outfit into a completely new outfit each time one wears it – one size will fit all body shape and sizes.

20. To incorporate other synthetic and natural fibres into the texturised polyester base Before the foil/pigment application will result in a different handle of the end produced material, for example; to incorporate LycraTM into the warp base will result in the finished material to return to its original form after it has been stretched (for figure hugging garments the structure will maintain its shape and will only stretch and change colour in conjunction with the individuals body movements).

21. As claimed in claims 1 to 20 it is the object of the present invention to provide a textile material in which the appearance of the material can be altered by means of stretching the fabric. In certain embodiments the appearance is reversible, so that returning the textile to its original form returns it substantially to its original appearance, the stretching is sufficient to cause the fabric structure and "makeup" to be altered causing the threads to become mobile within the body of the fabric, longitudinal action will see the fabric contract and shrink in width and increase in length; transverse action will see the fabric increase in width and shrink in length, in turn resulting in the striking visual colour change properties of the material.

Abstract.

Title: Method of making a textile material and textile material made thereby.

A textile material comprises a woven fabric base to which a thin foil is glued, the resulting laminate then being biaxially stretched, which loosens the weave and breaks the foil into discrete elements. The appearance of the resulting fabric can be altered by stretching in either a longitudinal or transverse manner. Stretching in one direction removes all of the foil from the surface so that the base fabric is visible and producing a thicker softer textile, whilst stretching in the other brings much of the foil back to the surface altering the appearance of the fabric or revealing any patterns made using the foil and producing a thinner textile. Subsequent stretches repeat these two steps. The foil may comprise a metallic foil and the fabric base may comprise texturised polyester.

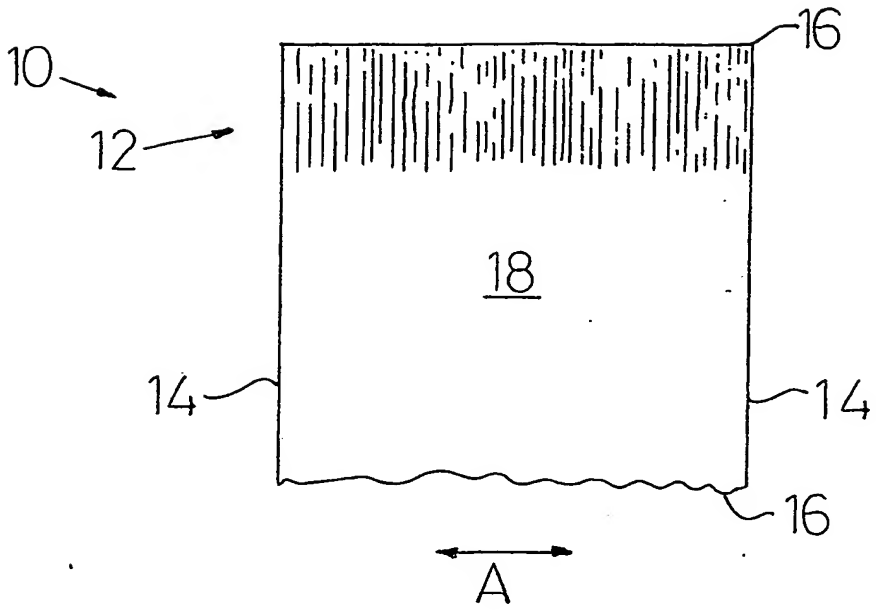

FIG 1

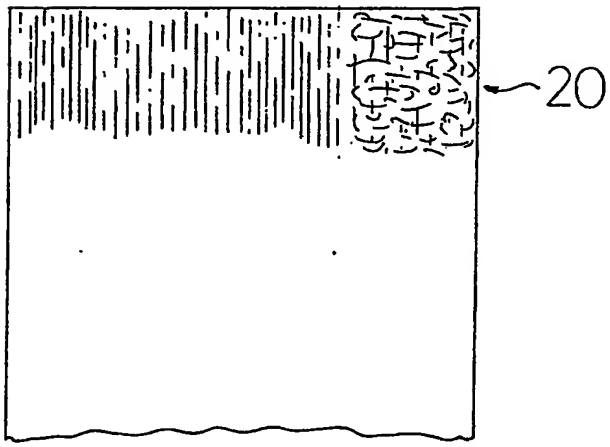

FIG 2

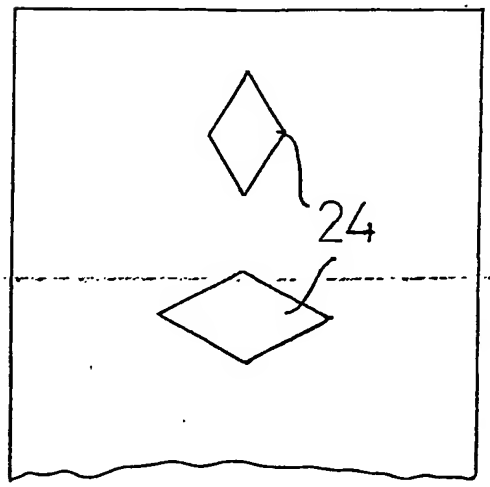

FIG 3